1.6 Linear Coordinate Geometry Starter Questions

The point P has coordinates $(-2, 2)$, the point Q has coordinates $(1, 6)$ and the point R has coordinates $(5, 3)$.

Show that PQ and QR are perpendicular.

[3 marks]

gradient $PQ = \frac{4}{3}$	1
gradient $QR = -\frac{3}{4}$	1
$\frac{4}{3} \times -\frac{3}{4} = -1$ hence PQ and QR are perpendicular	1

C Coordinate geometry in the (x, y) plane

C1

Understand and use the equation of a straight line, including the forms $y - y_1 = m(x - x_1)$ and $ax + by + c = 0$; gradient conditions for two straight lines to be parallel or perpendicular.

Be able to use straight line models in a variety of contexts.

Assessed at AS and A-level

Teaching guidance

Students should:

- be able to solve problems using gradients, midpoints and the distance between two points, including the form $y = mx + c$ and the forms $y = a$ and $x = b$ for horizontal and vertical lines
- know that the product of the gradients of two perpendicular lines is –1
- Understand necessary and sufficient conditions for a quadrilateral to be a square, rectangle, rhombus, parallelogram, kite or trapezium and be able to apply understanding of straight lines to these.

C Coordinate geometry in the (x, y) plane

C1

Understand and use the equation of a straight line, including the forms $y - y_1 = m(x - x_1)$ and $ax + by + c = 0$; gradient conditions for two straight lines to be parallel or perpendicular.

Be able to use straight line models in a variety of contexts.

Notes

- In questions where the equation of a line is to be found, any correct form will be acceptable, unless specified in the question.
- However, trivial simplifications left undone in equations are likely to be penalised, eg $y - -2 = \frac{2}{4}(x - 1)$ should be simplified to $y + 2 = \frac{1}{2}(x - 1)$

1.6 Linear Coordinate Geometry

Example 9

Find the perpendicular ***bisector*** of the line joining the points and .

Write your answer in the form (where , and are integers).

1.6 Linear Coordinate Geometry

Example 10 - AS Paper 1 2021

ABCD is a trapezium where *A* is the point (1, −2), *B* is the point (7, 1) and *C* is the point (3, 4)

DC is parallel to *AB*.

AD is perpendicular to *AB*.

(a) (i) Find the equation of the line *CD*.

[2 marks]

(a) (ii) Show that point *D* has coordinates (−1, 2)

[3 marks]

(b) (i) Find the sum of the length of *AB* and the length of *CD* in simplified surd form.

[2 marks]

(b) (ii) Hence, find the area of the trapezium *ABCD*.

[2 marks]

Q	Marking instructions	AO	Marks	Typical solution
4(a)(i)	Uses coordinates of A and B to find gradient of AB	3.1a	M1	Grad $AB = \frac{3}{6} = \frac{1}{2}$ = Grad DC Equation is $y - 4 = \frac{1}{2}(x - 3)$ $2y = x + 5$
	Obtains correct equation of CD (any form)	1.1b	A1	
	Subtotal		**2**	

Q	Marking instructions	AO	Marks	Typical solution
4(a)(ii)	Uses perpendicular gradients property.	1.1a	M1	Grad $DA = \frac{-1}{\text{Grad AB}} = -2$ Equation is $y + 2 = -2(x - 1)$ $y = -2x$ Intersect at $(-1, 2) = D$
	Obtains correct equation of AD using their gradient (any form) Or shows that A to (-1, 2) has required gradient of -2	1.1b	A1F	
	Obtains correct coordinates of D Or shows that C to (-1,2) has required gradient of -0.5 Or shows that (-1, 2) lies on both lines	1.1b	A1	
	Subtotal		**3**	

Q	Marking instructions	AO	Marks	Typical solution
4(b)(i)	Calculates length of AB and CD. At least one correct.	1.1a	M1	$AB = \sqrt{(36 + 9)} = \sqrt{45} = 3\sqrt{5}$ $CD = \sqrt{(4 + 16)} = \sqrt{20} = 2\sqrt{5}$
	Obtains correct simplified sum	1.1b	A1	$AB + CD = 5\sqrt{5}$
	Subtotal		**2**	

Q	Marking instructions	AO	Marks	Typical solution
4(b)(ii)	Calculates AD and applies trapezium area formula	1.1a	M1	$AD = \sqrt{(4 + 16)} = \sqrt{20} = 2\sqrt{5}$ $= \frac{1}{2}(5\sqrt{5} \times 2\sqrt{5})$
	Obtains correct area	1.1b	A1	$= 25$
	Subtotal		**2**	